

REC'D 12 NOV 2004

Rec'd PCT/PTO 25 JAN 2005 PCT

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT



(PCT Article 36 and Rule 70)

Applicant's or agent's file reference V80029WO	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/CA 03/01118	International filing date (day/month/year) 24.07.2003	Priority date (day/month/year) 25.07.2002
International Patent Classification (IPC) or both national classification and IPC H01M8/00		
Applicant ALBERTA RESEARCH COUNCIL INC. et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 8 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).
 These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:
 - I ☒ Basis of the opinion
 - II ☐ Priority
 - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - IV ☒ Lack of unity of invention
 - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI ☐ Certain documents cited
 - VII ☐ Certain defects in the international application
 - VIII ☐ Certain observations on the international application

Date of submission of the demand 20.02.2004	Date of completion of this report 11.11.2004
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Schwaller, J-M Telephone No. +49 89 2399-8351 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

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I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-19 as originally filed

Claims, Numbers

1-36 as originally filed

Drawings, Sheets

1/7-7/7 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees, the applicant has:

- ☐ restricted the claims.
☒ paid additional fees.
☐ paid additional fees under protest.
☐ neither restricted nor paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

- ☐ complied with.
☒ not complied with for the following reasons:

see separate sheet

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

- ☒ all parts.
☐ the parts relating to claims Nos. .

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-36
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	1-36
Industrial applicability (IA)	Yes: Claims	1-36
	No: Claims	

2. Citations and explanations

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see separate sheet

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Re Item IV

Lack of unity of invention

The present international application lacks unity for the following reasons:

The common concept between independent claims 1, 17 and 24 is a tubular solid oxide fuel cell assembly comprising:

- a tubular metallic porous support having sufficient porosity and strength to allow a reactant flow therethrough
- a tubular layer assembly supported thereon, this layer comprising concentrically
 - i) an inner electrode layer
 - ii) a middle electrolyte layer
 - iii) an outer electrode layer

Such an entity being known from eg. WO 01/09968 (page 11, lines 1-34; page 14, lines 15-22; page 19, lines 14-17; Figure 5D) and US-A-6080501 (see column 3, lines 10-54), there is thus no special technical feature linking together the subject-matter of the above independent claims, which therefore lack unity.

This Authority thus considers that there are 2 inventions covered by the claims indicated as follows:

Invention 1: Claims 1-23, which define a tubular fuel cell assembly is supposed to solve the problem of having a functional layer (comprising an electrolyte layer sandwiched between two electrodes said functional layer) with a thin wall thickness with a simultaneous sufficient mechanical strength and porosity;

Invention 2: Claims 24-36 which define a method for producing a tubular fuel cell assembly supposed to solve the problem of reducing the manufacturing costs.

Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
~~citations and explanations supporting such statement~~**

Reference is made to the following documents:

D1: WO-A-0109968

D2: US-A-6080501

D3: WO 01/86030 A

First invention

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1. Document **D1** (claims 112, 114-120; Figures 2A-2C) discloses a tubular solid oxide fuel cell assembly comprising the features of the functional layer assembly defined under paragraph (b) of present claim 1 with the exception that the thickness thereof is not explicitly disclosed.

D1 (page 19, lines 14-17) further discloses that the functional layer assembly may be disposed on a porous substrate, which is preferably an inexpensive metal having high strength (page 19, lines 4-6).

Thus **D1** already solves the problem of providing a tubular fuel cell having **high mechanical strength and porosity**

D1 (claim 117) further discloses that the ceramic middle electrolyte layer (called "sintered coating in **D1**) has preferably a thickness of from 5 to 20 microns.

Thus the subject-matter of instant claim 1 distinguishes from **D1** in that the thickness of the two electrode layers are not explicitly disclosed; however at page 19, line 11 and page 20, lines 5-6, **D1** suggests to maintain the thickness thereof as thin as possible.

Thus, the thickness value presently claimed, ie. less than 80 microns is an **arbitrary selected value** that the skilled man faced with the problem of manufacturing a tubular fuel cell with the above indicated properties would at least try and thus arrive at the subject-matter claimed, which therefore **lacks an inventive step over the content of D1 taken alone**.

2. **D2** (column 2, line 45 to column 3, line 62) also discloses a tubular fuel cell having high strength and porosity and comprising all the features of present claim 1 with the exception that the thickness of the functional layer assembly is not disclosed.

~~However, it is clear that the skilled person faced with the problem of manufacturing~~ such a tubular fuel cell will inevitably try to lower the costs of the materials employed as low as possible, ie. maintain the thickness of the said functional assembly as low as possible and thus inevitably fall within the cope of protection of present claim 1, which therefore also lacks an inventive step over **D2** taken alone.

3. In view of the above paragraphs, claim 1 does not meet the requirements of Article 33(3) PCT.

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4. Dependent claims 2-23 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of Article 33 PCT, said features being either known from the above prior art or conventional in the field of fuel cells or within the competence of a skilled man seeking to improve the prior art fuel cells known from **D1 or D2**.

Second invention

1. **D3**(claims 17-19) discloses a method of manufacturing a tubular solid oxide fuel cell according to the subject-matter of present claim 24, which the exception that the claims 17-19 do not disclose that the combustible substrate must be non-conductive.

Claim 9 of D3 however explicitly suggests to use organic or polymeric compounds which, according to the knowledge of the examining authority, cannot be generally classified as being conductive.

The subject-matter thus lacks novelty over D3.

The Applicant argued that D3 requires that the fibre core be conductive. This is acknowledged however D3 also teaches that when the fiber is non-conductive, it may be treated to render it conductive; this is exactly what is presently claimed in step (a) of claim 24.

Furthermore, even if the subject-matter claimed would be novel it is really within the competence of a skilled person face with the problem of reducing the costs of a manufacturing process to replace a cost-effective material by a cheaper one.

Thus claim 24 does not meet the requirements of Article 33 PCT.

2. Dependent claims 25-36 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of Article 33 PCT, said features being either known from the above prior art or conventional in the field of fuel cells or within the competence of a skilled man seeking to improve the prior art fuel cells known from **D1, D2 or D3**.

Certain published documents

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Although the documents **WO 03/069705** and **WO 03/062503**, cited in the International Search Report, do not constitute prior art for the purposes of Article 33(2) and (3) PCT, their content is of particular relevance (see in particular the passages cited in the search report) and may be opposed under **novelty** to the subject-matter claimed in the present international application in its regional (or national) phases.
